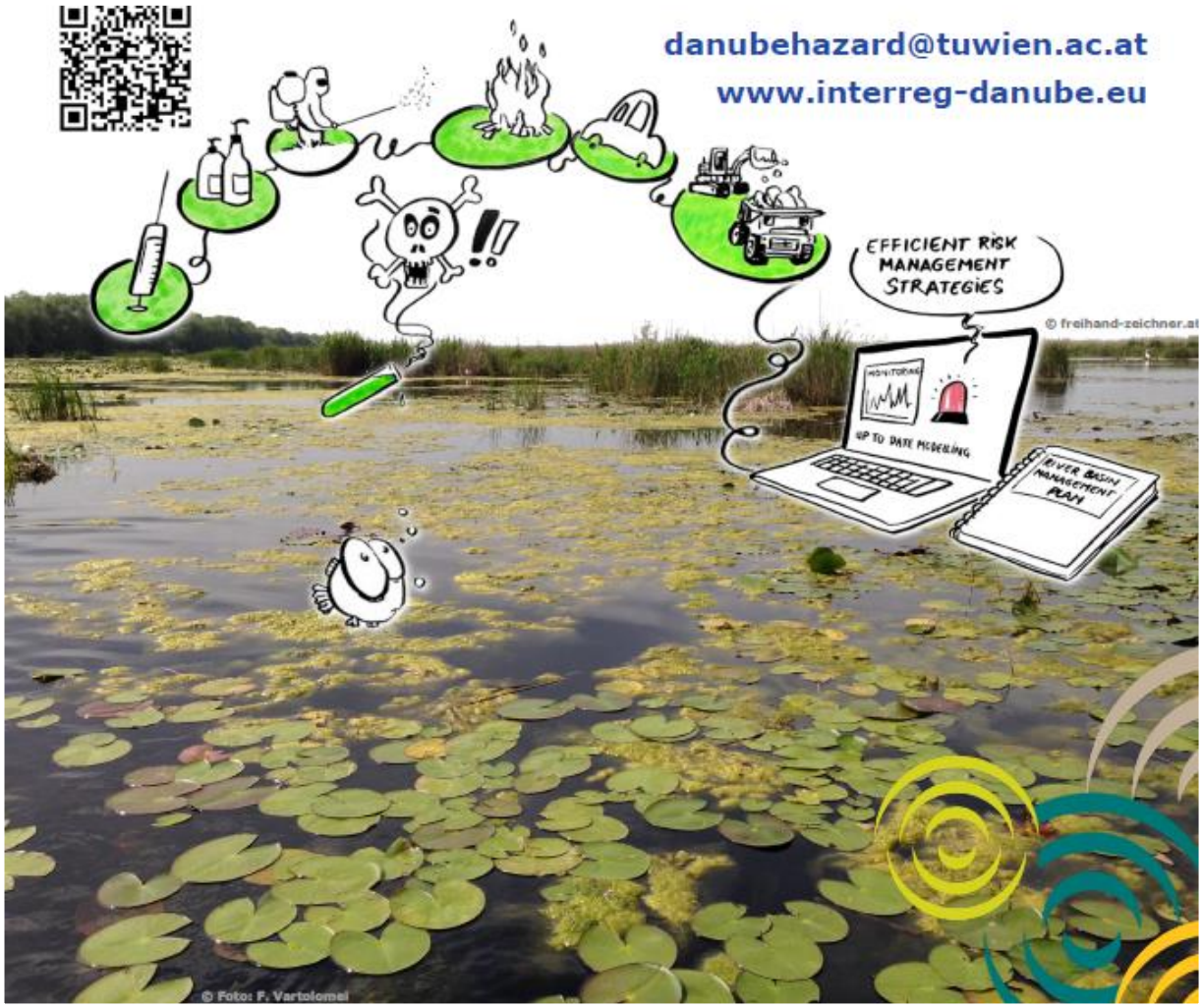

Output T2.3

Demonstration of the management plan development process at watershed levels for Hazardous Substances pollution based on detailed emission modelling in seven pilot regions 2023

Factsheet for the Koppany Pilot area

Project co-funded by European Union funds (ERDF, IPA, ENI) and National Funds of the participating countries

PROJECT TITLE: Tackling hazardous substances pollution in the Danube River Basin by Measuring, Modelling-based Management and Capacity building

ACRONYM: Danube Hazard m³c

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AUTHORS AND CONTRIBUTING PARTNERS

Name co-author	Contributing partner
Marianne Bertine Broer	Environment Agency Austria (Umweltbundesamt), AT
Clemens Steidl	Environment Agency Austria (Umweltbundesamt), AT
Thomas Rosmann	Environment Agency Austria (Umweltbundesamt), AT
Steffen Kittlaus	TU Wien, AT
Matthias Zessner	TU Wien, AT
Ottavia Zoboli	TU Wien, AT
Renata Kaps	TU Wien, AT
Adrienne Clement	Budapest University of Technology and Economics (BME), HU
Zsolt Jolankai	Budapest University of Technology and Economics (BME), HU
Galina Dimova	Bulgarian Water Association, BG
Radoslav Tonev	Bulgarian Water Association, BG
Adam Kovacs	ICPDR, AT
Jos van Gils	Deltaris, NL

Responsible for the Output: Oliver Gabriel (Environment Agency Austria)

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1. General introduction

Based on a one-year surface water monitoring, samples were taken once a week and combined to two-months composite samples and analyzed. Sampling took place mostly at low and mean flow conditions. The monitoring was established in all seven pilot regions in four countries (RO, BG, HU, AT) with a total of 20 surface water monitoring sites. From these results a mean annual concentration was calculated, which should be comparable to 12 fold monthly monitoring results, often used for the risk assessment under the Water Framework Directive. The risk assessment considers the following different inorganic and organic substances:

- Perfluorooctanesulfonic acid (PFOS), Perfluorooctanoic acid (PFOA) (industrial chemicals)
- 16 EPA Polycyclic aromatic hydrocarbons (PAHs, industrial chemicals, and combustion by-products)
- Mercury (Hg), Cadmium (Cd), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn), Chromium (Cr) and Arsenic (As) (metals)
- Diclofenac and Carbamazepine (pharmaceuticals)
- 4-tert-Octylphenol (industrial chemical)
- Nonylphenol (industrial chemical)
- Bisphenol A (industrial chemical)
- S-Metolachlor (herbicide) including Metolachlor-ESA and Metolachlor-OA (metabolites)
- Tebuconazole (fungicide)

Results from all monitoring stations were compared with the environmental quality standards (EQS) of Directive2008/105/EU (Priority Substances) and with the substances enacted at the national level (National Substance List). Exceedances are shown in **Fehler! Verweisquelle konnte nicht gefunden werden.**.

Table 1 Overview of the exceedance of the EQS in all pilot areas. The numbers indicate the number of sites, regions and countries with exceedance of the EQS values

Substance > EQS	Substance Group	No of monitoring sites	No of pilot regions	No of countries	Regulation
PFOS	Industry	9	5	4	Directive 2008/105/EU
Cu	Heavy Metals	2	1	1	National Substance List
Cd	Heavy Metals	2	1	1	Directive 2008/105/EU
Zn	Heavy Metals	2	1	1	National Substance List
s-Metolachlor	Pesticides	2	1	1	National Substance List

In a second step, for each substance, dominant pathways were evaluated for each catchment by means of emission modelling. Considering the dominant polluters or pathways, scenarios were formulated, which, describe the general potential of a specific measure to mitigate pollution.

The emission modelling was carried out for 34 sub-catchments in seven pilot areas which are situated in four countries. A detailed description of the model, the modelling results and validation can be found in OT 2.2 Report on improved system understanding.

Note: The new proposals of the revised Priority Substance List were also assessed, but do not form a legal basis for the designation of measures at the present time.

2. General information Koppany Catchment

The Koppany catchment is devided into two sub-catchments. Both catchments are equipped with a monitoring station.

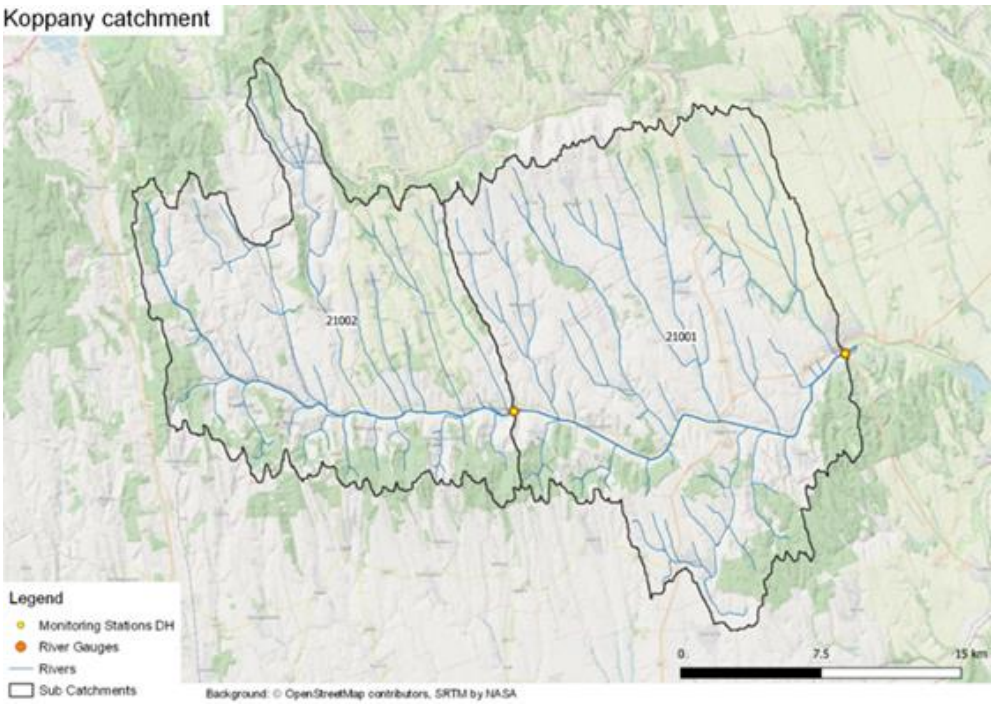

Figure 1 Overview of the pilot area, with monitoring stations

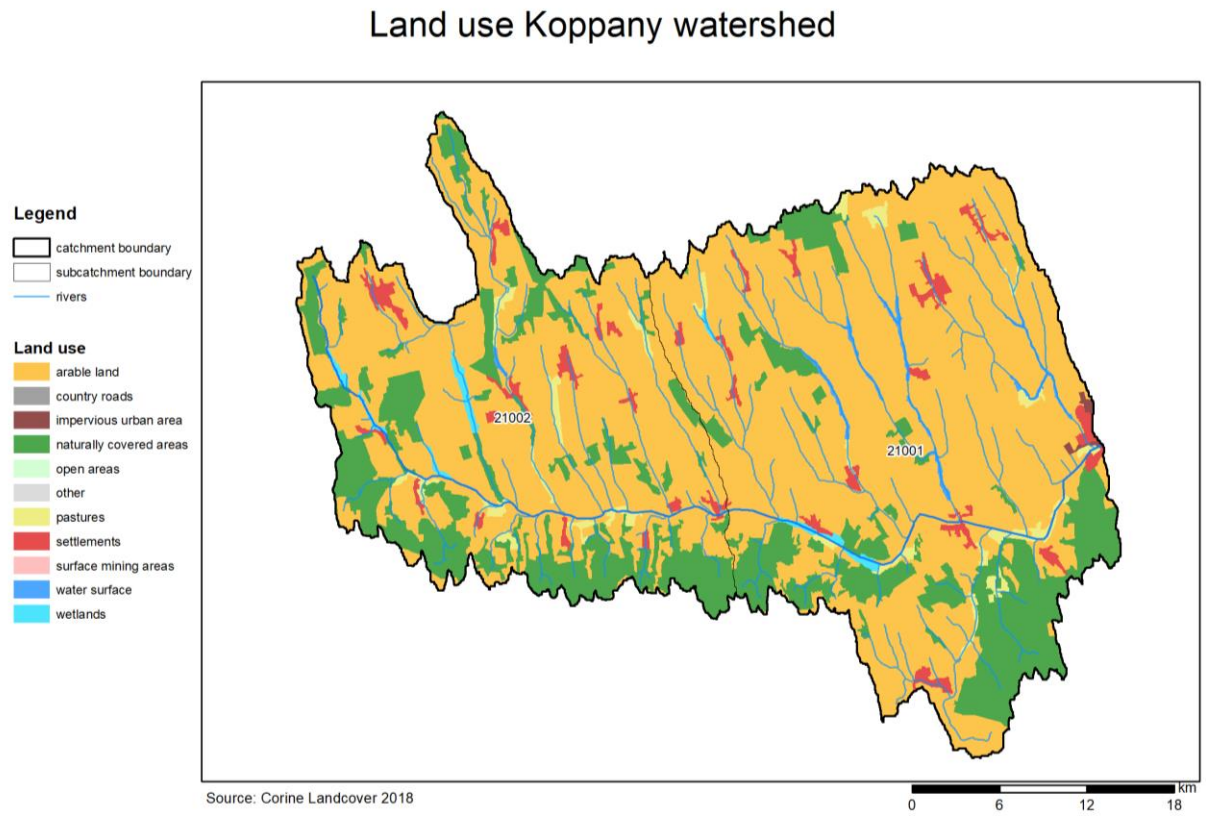

Figure 2 Land use in the pilot area

Arable land dominates the landuse, with a high share on slopes steeper than 4 %. The population density is low. The runoff is low, too. With 60 mm it is comparable to other pilot regions with similar conditions (Wulka, AT; Zagyva, HU).

Table 2 Basic information for the Somesul Mic pilot area

Pilot region	Catchment Area [km2]	Mean Elevation [m]	Population density [Inh/km2]	Arable land [%]	Arable land > 4% slope [%]	Pasture [%]	Forest [%]	Urban Area [%]	Runoff [mm]
Koppany	658,4	181	27	60,6	38,9	3,5	24,9	2,8	60

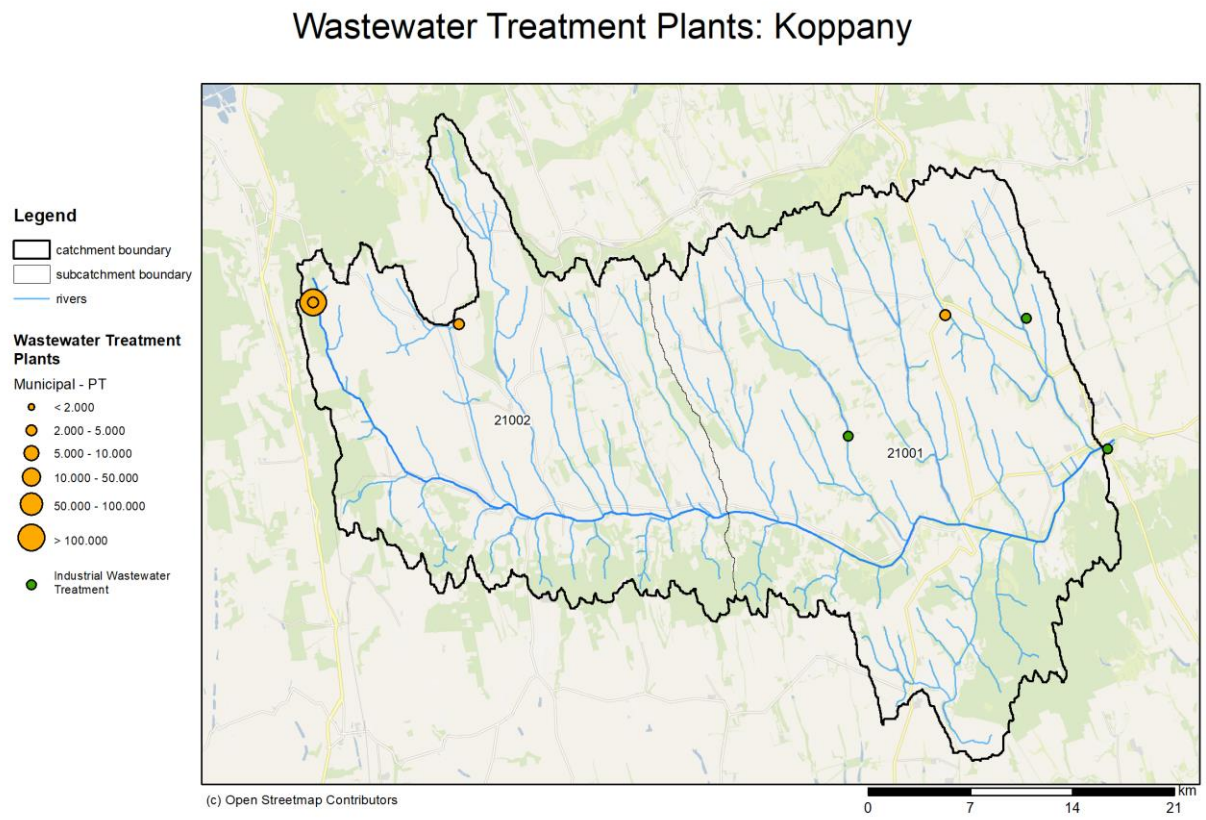

Figure 3 Overview of the point sources in the pilot area

In the Koppany chatchment 4 municipal WWTPs with a capacity above 2000 PE and 3 industrial WWTPs are present.

3. Risk assessment: Pesticides/Agriculture/s-Metolachlor:

The monitoring results point out an exceedance of the Hungarian EQS (0,2 µg/l) for s-Metolachlor by factor 29 in catchment 21002 and factor 58 (in 21001).

General information: S-Metolachlor is a herbizide applicated on cultures, like oil pumpkin, soy-bean, sugar beet and maize but also to different kind of vegetables and fruits.

Model results for pesticides are implemented in the MoRE modelling environment for the first time. Up to now, the calculation of potential application rates of s-Metolachlor, prepared in DHm3c on base of culture specific application rates (available for Austria and Hungary), point out moderate (Austrian approach) to high potential area specific application (Hungarian approach with more crops involved) in the pilot region. Calculation of surface water concentration of s-Metolachlor and metab-olites on base of an application specific transfer algorithm underlines the serious exceedance of s-Metolachlor, measured also in both monitoring stations.

A second model approach should include a pathway specific evaluation. Concentration and water-balance in different environmental and technical compartments give first insights in potential pathway related mitigation measures.

3.1 Specific situation for Koppany

Concentrations of s-Metolachlor in arable soils show increased values in five from six composite samples. In all four samples of suspended matter from high flow events, the concentrations of s-Metolachlor were increased, too; in atmospheric deposition only in May and June s-Metolachlor concentrations were analyzed above the limit of detection. All findings give evidence of transport by erosion and surface runoff being at least periodically of relevance. All samples from WWTP were below the limit of detection.

The water balance in Koppany is dominated by subsurface- and base flow with around 60%; Surface runoff has a share of around 10%. Effluent from Waste Water Treatment Plants share in a magnitude of 5% in 21001 and around 25% in 21002. From figure 4 it becomes clear that the area specific emissions are roughly in the same range for both subcathments (0.01 mg/ha·a^{-1} for 21002 and 0.02 mg/ha·a^{-1} for 21001)

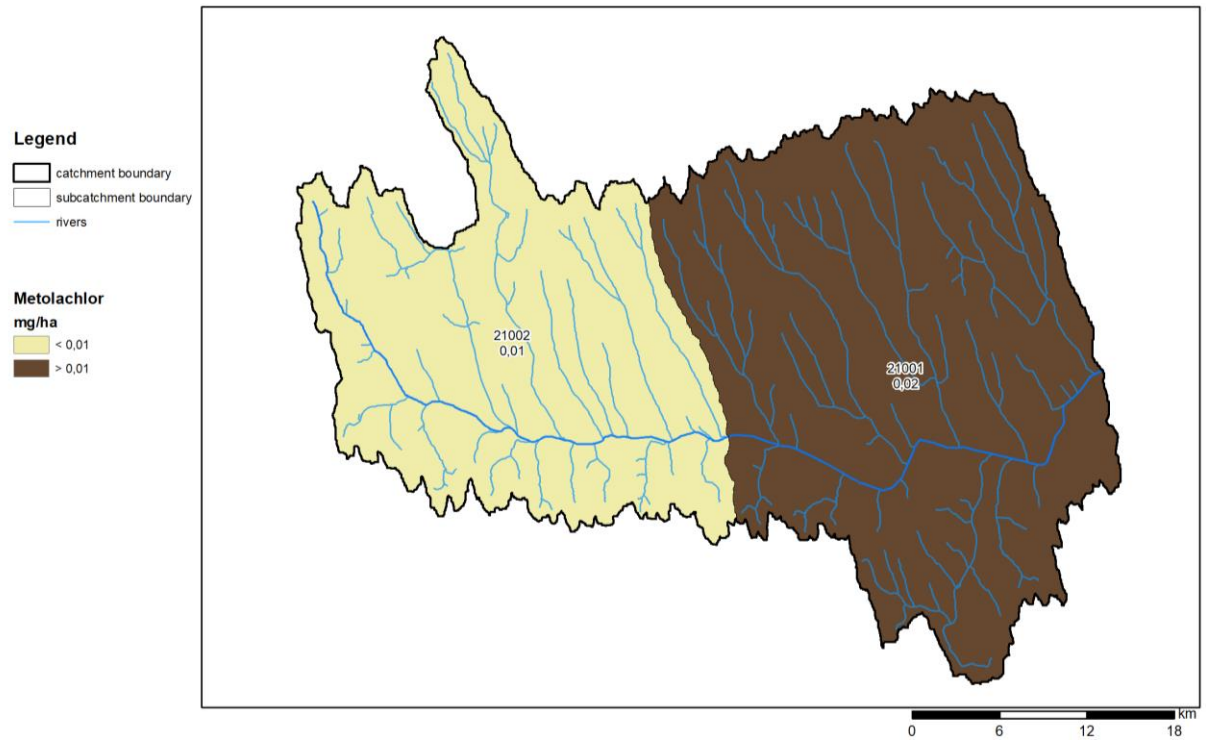

Figure 4 Area specific total s-Metalochlor emissions in the Koppany catchment.

At this moment it was not possible to obtain a good model fit for s-Metolachlor with the available data, therefor a pathway analysis and subsequently the implementation of model scenarios could not be conducted.

3.2 Proposals for potential mitigation measures:

Source control: reduction of s-Metolachlor application by 50% on all relevant crops and reduction of erosion from arable land by 50%.

Please note: The proposed measures are based exclusively on what is theoretically feasible and quantifiable as a scenario in the model. They do not consider the aspect of proportionality and have no impact on a possible practical implementation!

3.3 Initiate a stakeholder involvement

There were 9 local, regional and national expert who responded to the questionnaire for the Koppany pilot area, regarding the migitation measures for s-Metolachlor. 4 experts think that reduction 50% of s-Metolachlor and its substitution by other products and the listed alternatives is realistic, 3 experts think that a reduction of 30% is realistic and 2 experts think that a reduction of 20% is realistic. 5 experts think that reduction of erosion by 50% realistic, 2 experts think that a reduction of 30% is realistic and 1 experts think that a reduction of 20% is realistic. Prevention of drift is deemed a relevant measure protect surface waters from pesticides by 6 experts. Prevention of emission via surface runoff and erosion is deemed a relevant measure protect surface waters from pesticides by 8 experts. Two additional measures were suggested: Landscape-sensitive management and creating wetlands or ponds at the mouths of intermittent watercourses to capture most of the sediment washed away by slowing run-off in the event of sudden significant rainfall events

4. Closing the data gaps

As stated in paragraph 3.1, taken into account the currently available data is was not possible to obtain a good model fit, the model under estimated the river loads and concentration significantly, which indicated that not all relevant pathways are represented by meaningful data. For instance for the storm water sewers no data on concentrations was available.